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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,215	11/17/2003	Tae-Wan Kim	249/392	2486

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EXAMINER

BERNATZ, KEVIN M

ART UNIT PAPER NUMBER

1773

DATE MAILED: 07/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/713,215	KIM ET AL.	
	Examiner	Art Unit	
	Kevin M. Bernatz	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 10-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☒ Claim(s) 1-21 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 November 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>1/24/05</u> . | 6) <input type="checkbox"/> Other: ____. |

✓

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I, claims 1 - 9 in the reply filed on May 4, 2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Claims 10 – 21 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. The requirement is still deemed proper and is therefore made FINAL.

Drawings

2. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2, 3 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "rich" in claim 2 is a relative term which renders the claim indefinite. The term "rich" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. For purposes of evaluating the prior art, the Examiner has given the term(s) the broadest reasonable interpretation(s) consistent with the written description in applicants' specification as it would be interpreted by one of ordinary skill in the art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Donaldson Co., Inc.*, 16 F.3d 1190, 1192-95, 29 USPQ2d 1845, 1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, the Examiner has required that at least one "layer" (or part of a layer if the layer is formed of a composition gradient) that contacts the interface of the tunnel barrier must possess at least some amount of Nitrogen.

Where applicant acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process*

Control Corp. v. HydReclaim Corp., 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term “fixed layer” in claim 3 is used by the claim to mean a multilayer structure including a seed layer, a pinning layer and a pinned layer, while the accepted meaning is as an equivalent term to the “pinned” (or reference) layer. The term is indefinite because the specification does not clearly redefine the term. For purposes of evaluating the prior art, the Examiner has interpreted claim 3 as reciting: “wherein the tunnel junction includes a seed layer and a pinned layer, which are sequentially deposited between the substrate and the fixed layer.”

Where applicant acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term “semi-ferromagnetic” in claim 5 is used by the claim to mean “antiferromagnetic”, while the accepted meaning is not art recognized. The term is indefinite because the specification does not clearly redefine the term. For purposes of evaluating the prior art, the Examiner has interpreted claim 5 as reciting that the pinning layer “is an antiferromagnetic layer formed of ...”. The Examiner notes that amendment of the specification and claims to recite “antiferromagnetic” instead of “semi-ferromagnetic” would not be deemed new matter given the art recognized nomenclature of “antiferromagnetic” used for pinning layers composed of FeMn and IrMn.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1 – 9 are rejected under 35 U.S.C. 102(a) and/or (e) as being anticipated by Hiramoto et al. (U.S. Patent App. No. 2003/0017723 A1).

Regarding claim 1, Hiramoto et al. disclose a magnetic tunnel junction device (*Paragraph 0002*) comprising a substrate, and a fixed layer, a tunnel barrier layer and a free layer sequentially stacked on the substrate, wherein a magnetoresistance (MR) buffer layer formed of a metallic nitride is interposed between the fixed and the tunnel barrier (*Paragraphs 0158 – 0169 and see Table I below*).

Regarding the limitation(s) “and the entire magnetic tunnel junction device is thermally treated”, the Examiner notes that this limitation(s) are/(is a) process limitation(s) and is/are not further limiting in terms of the structure resulting from the claimed process. Specifically, in a product claim, as long as the prior art product meets the claimed structural limitations, the method by which the product is formed is not germane to the determination of patentability of the product unless an unobvious

Art Unit: 1773

difference can be shown to result from the claimed process limitations. In the instant case, since Hiramoto et al. also disclose thermally treating the entire tunnel junction (*Paragraphs 0117 – 0126*), the Examiner deems that there is no “non-obvious” difference in the disclosed and claimed structures.

The limitation(s) “so as to reduce the magnetic junction resistance thereof” is (an) intended use limitation(s) and is not further limiting in so far as the structure of the product is concerned. Note that “in apparatus, article, and composition claims, intended use must result in a **structural difference** between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. ***If the prior art structure is capable of performing the intended use, then it meets the claim.***

In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art.” [emphasis added] *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963). See MPEP § 2111.02. In the instant case, since Hiramoto et al. thermally treating the tunnel junction, the Examiner deems that there would be no structural difference between the claimed and prior art product based on the intended use of the thermal treatment (see *Paragraphs 0117 – 0126*).

Table I: Illustration of How Prior Art is Deemed to Read on Claimed Structure

Claimed layer	Layer in Prior Art
Substrate	Si/SiO ₂ substrate
Fixed	Portion of FeSiAl layer nearest substrate (i.e. low nitrogen/oxygen content part of magnetic layer)
Buffer	Middle portion of FeSiAl layer (i.e. middle nitrogen/oxygen content part of magnetic layer)
Barrier	Uppermost portion of FeSiAl layer (i.e. highest nitrogen/oxygen content part of magnetic layer)
Free layer	NiFe

The Examiner notes that Hiramoto et al. explicitly disclose forming the fixed/buffer layer as a dual layer structure (*Figure 6, elements 12a and 13*) wherein the ferromagnetic layer is formed to have a gradient (*Paragraphs 0068 – 0077; 0092; 0098; and 0107 – 0111*). Furthermore, Hiramoto et al. teach that the barrier layer can comprise multiple layers (*Paragraphs 0068 – 0074*). As such, the Examiner deems there is sufficient specificity that the above structure would be equivalent to applicants' claimed structure as described above in Table I.

Regarding claim 2, the Examiner notes that the "buffer layer" contains Nitrogen, and therefor meets the claimed limitation of being "nitrogen rich ... at the tunnel barrier" for the reasons cited above in Paragraph 4.

Regarding claims 3 – 6, Hiramoto et al. disclose layers meeting applicants' claimed structural and material limitations (*Paragraphs 0064 – 0066, wherein the "lower electrode" is deemed to read on the limitation "a seed layer"*).

Regarding claim 7, Hiramoto et al. disclose buffer layers meeting applicants' claimed limitations (*Paragraphs 0158 – 0169 – nitriding of the FeSiAl alloy will produce an FeN material since applicants' claims are open to the alloy including other elements*).

Regarding claim 8, Hiramoto et al. disclose both multi-layered barrier layers and barrier layers wherein the second magnetic layer and the portion of the barrier layer adjacent the second magnetic layer contains AlOx (*Paragraphs 0068 – 0071*).

Regarding claim 9, this is a process limitation and is not deemed to be further limiting in the structure of the tunnel device for the reasons cited above.

7. Claims 1 – 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Gill (U.S. Patent No. 6,108,177).

Regarding claim 1, Gill discloses a magnetic tunnel junction device (*Title*) comprising a substrate (*Figure 11, element 302*), and a fixed layer (*element 305*), a tunnel barrier layer (*element 308*) and a free layer (*element 310*) sequentially stacked on the substrate, wherein a magnetoresistance (MR) buffer layer (*element 306*) formed of a metallic nitride is interposed between the fixed and the tunnel barrier (*col. 5, lines 20 - 59*).

Regarding the limitation(s) "and the entire magnetic tunnel junction device is thermally treated", the Examiner notes that this limitation(s) are/(is a) process

limitation(s) and is/are not further limiting in terms of the structure resulting from the claimed process. Specifically, in a product claim, as long as the prior art product meets the claimed structural limitations, the method by which the product is formed is not germane to the determination of patentability of the product unless an unobvious difference can be shown to result from the claimed process limitations. In the instant case, there is no evidence of record that thermal treating results in an *unobvious* difference in structure than the disclosed prior art tunnel junction.

The limitation(s) "so as to reduce the magnetic junction resistance thereof" is (an) intended use limitation(s) and is not further limiting in so far as the structure of the product is concerned. Note that "in apparatus, article, and composition claims, intended use must result in a **structural difference** between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. ***If the prior art structure is capable of performing the intended use, then it meets the claim.***

In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art." [emphasis added] *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963). See MPEP § 2111.02.

Regarding claim 2, the Examiner notes that the "buffer layer" contains Nitrogen, and therefor meets the claimed limitation of being "nitrogen rich ... at the tunnel barrier" for the reasons cited above in Paragraph 4.

Regarding claims 3 – 6, Gill discloses layers meeting applicants' claimed structural and material limitations (*Elements 314, 304 and col. 5, lines 20 - 59*).

Regarding claim 7, Gill discloses buffer layers meeting applicants' claimed limitations (*col. 5, lines 20 - 59*).

Regarding claim 8, Gill discloses barrier layers meeting applicants' claimed limitations (*col. 5, lines 20 - 59*).

Regarding claim 9, this is a process limitation and is not deemed to be further limiting in the structure of the tunnel device for the reasons cited above.

8. Claims 1 – 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Hiramoto et al. (U.S. Patent No. 6,771,473 B2).

Regarding claim 1, Hiramoto et al. disclose a magnetic tunnel junction device (*col. 1, lines 10 - 15*) comprising a substrate (*col. 12, line 40 bridging col. 13, line 63 – silicon substrate*), and a fixed layer (*col. 13, lines 48 – 63 – “Co(3)/Ru(0.7)/Co(2)”*), a tunnel barrier layer (*col. 13, lines 48 – 63 – “intermediate layer”*) and a free layer (*col. 13, lines 48 – 63 – “NiFe(5)”*) sequentially stacked on the substrate, wherein a magnetoresistance (MR) buffer layer (*col. 13, lines 48 – 63 – “Fe(1)” replaced by FeN*) formed of a metallic nitride is interposed between the fixed and the tunnel barrier.

Regarding the limitation(s) “and the entire magnetic tunnel junction device is thermally treated”, the Examiner notes that this limitation(s) are/(is a) process limitation(s) and is/are not further limiting in terms of the structure resulting from the claimed process. Specifically, in a product claim, as long as the prior art product meets the claimed structural limitations, the method by which the product is formed is not germane to the determination of patentability of the product unless an unobvious

difference can be shown to result from the claimed process limitations. In the instant case, there is no evidence of record that thermal treating results in an *unobvious* difference in structure than the disclosed prior art tunnel junction.

The limitation(s) "so as to reduce the magnetic junction resistance thereof" is (an) intended use limitation(s) and is not further limiting in so far as the structure of the product is concerned. Note that "in apparatus, article, and composition claims, intended use must result in a **structural difference** between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. ***If the prior art structure is capable of performing the intended use, then it meets the claim.***

In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art." [emphasis added] *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963). See MPEP § 2111.02.

Regarding claim 2, the Examiner notes that the "buffer layer" contains Nitrogen, and therefor meets the claimed limitation of being "nitrogen rich ... at the tunnel barrier" for the reasons cited above in Paragraph 4.

Regarding claims 3 – 6, Hiramoto et al. disclose layers meeting applicants' claimed structural and material limitations (*col. 8, lines 5 - 40*).

Regarding claim 7, Hiramoto et al. disclose buffer layers meeting applicants' claimed limitations (*col. 13, lines 48 - 53*).

Regarding claim 8, Hiramoto et al. disclose barrier layers meeting applicants' claimed limitations (*col. 12, line 40 bridging col. 13, line 63*).

Regarding claim 9, this is a process limitation and is not deemed to be further limiting in the structure of the tunnel device for the reasons cited above.

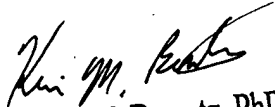
Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M. Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB
July 21, 2005


Kevin M. Bernatz, PhD
Primary Examiner